CLAIMS

1. A surface-treated steel sheet comprising:

a steel sheet;

a plating layer provided on at least one of the surfaces of the steel sheet, the plating layer containing at least one metal selected from the group consisting of zinc and aluminum;

a first layer film provided on the surface of the plating layer and containing (α) 1 to 2000 mg/m^2 of silica in terms of SiO_2, (β) a total of 1 to 1000 mg/m^2 of phosphoric acid groups in terms of P, (γ) a total of 0.5 to 800 mg/m^2 of at least one metal selected from the group consisting of Mg, Mn, and Al in terms of a metal element, and (δ) 0.1 to 50 mg/m^2 of a tetravalent vanadium compound in terms of V; and

a second layer film formed to a thickness of 0.1 to 5 μm on the first layer film and containing a resin (A) having at least one type of functional group selected from the group consisting of OH and COOH groups, and at least one rust-proofing additive (B) selected from the group consisting of the following compounds (a) to (e):

(a) a phosphate;

(b) Ca ion-exchanged silica;

(c) a molybdate;

(d) silicon oxide; and

(e) at least one organic compound selected from the group consisting of triazoles, thiols, thiadiazoles, thiazoles, and thiurams.

2. The surface-treated steel sheet according to claim 1, wherein the resin (A) is a product (X) of reaction of a film-forming organic resin with an active hydrogen-containing substance (D) partially or entirely comprising a hydrazine derivative (C) having active hydrogen.

3. A surface-treated steel sheet having excellent corrosion resistance, conductivity, and coating appearance, the steel sheet comprising:

a steel sheet having a zinc-based or aluminum-based coating;

a composite oxide film formed as a first layer film on a surface of the steel sheet and containing (α) silica, (β) phosphoric acid and/or a phosphoric acid compound, (γ) at least one metal selected from the group consisting of Mg, Mn, and Al (the metal may be contained as a compound and/or a complex compound), and (δ) a tetravalent vanadium (V(VI)) compound, the coating weights of these components being as follows:

(α) silica: 1 to 2000 mg/m^2 in terms of SiO_2;

(β) phosphoric acid and/or a phosphoric acid compound: a total of 1 to 1000 mg/m^2 in terms of P;

(γ) at least one metal selected from the group consisting of Mg, Mn, and Al: a total of 0.5 to 800 mg/m^2 in terms of Mg, Mn, or Al; and

(δ) a tetravalent vanadium compound: 0.1 to 50 mg/m^2 in terms of V; and

an organic film formed as a second layer film having a thickness of 0.1 to 5 μm on the first layer film and containing an organic polymeric resin (A) having an OH group and/or a COOH group, and at least one rust-proofing additive (B) selected from the group consisting of the compounds (a) to (e) below in a total of 1 to 100 parts by mass (solid content) relative to 100 parts by mass (solid content) of the resin (A):

(a) a phosphate;

(b) Ca ion-exchanged silica;

(c) a molybdate;

(d) silicon oxide; and

(e) at least one organic compound selected from the group consisting of triazoles, thiols, thiadiazoles, thiazoles, and thiurams.